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FACULTY OF ENGINEERING AND TECHNOLOGY

DEPARTMENT OF COMPUTER ENGINEERING

COURSE: CEF 440 - Internet Programming and Mobile Programming

TASK 3: REQUIREMENT ANALYSIS of the biometric student's attendance app

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INTRODUCTION

In an era where technology continues to reshape various aspects of our lives, it is imperative for educational institutions to embrace innovative solutions for attendance tracking. Traditional methods, like manual roll calls, are often time-consuming, error-prone, and susceptible to manipulation. This requirement analysis document presents an in-depth exploration of the development of biometric student attendance mobile application that utilize fingerprint as a unique identifier address these concerns. By harnessing the power of biometrics, we aim to revolutionize the traditional methods of attendance taking and introduce a more accurate, secure, and efficient approach for student's attendance making.

1. OBJECTIVE

The objective of the requirement analysis is to comprehensively identify, document, and prioritize the specific needs, functionalities, constraints, and expectations of stakeholders. This phase aim to establish a clear understanding of the system requirement and lay the foundation for the subsequent stage of development.

2. END USERS IDENTIFICATION

End users play a vital role in shaping the development and adoption of the attendance app. By engaging them from the outset, we foster a collaborative environment where diverse perspectives converge to shape an attendance solution that is robust, user-friendly, and aligned with institutional goals. As we embark on the journey of end user identification for our biometric student attendance mobile application project, it's essential to understand the diverse roles and contributions each party brings.

The end users involved in our project include:

- **Lecturers/instructors:** The professors and instructors need accurate attendance data for academic purposes. They are responsible for managing the attendance of their courses, they fall under the user category.
- **Students:** The student will interact with the biometric system by marking the attendance using fingerprint.
- **Administrator (HOD):** responsible for managing and coordinating the entire system.

3. DETAILED REQUIREMENTS

3.1. Functional requirements

Functional requirements are specific statements that describe the desired behaviors, functionalities, or capabilities of a software system or application. These requirements outline the tasks, services, or functions that the software should perform to meet the needs and expectations of its users. Functional requirements typically specify the inputs, processing, and outputs of the system, as well as any constraints or limitations on its behavior. They focus on what the software *should do*, rather than how it should be implemented. Functional requirements serve as the basis for designing, developing, and testing software systems, ensuring that they fulfill their intended purpose and meet the desired functionality. Following are the functional requirements of our biometric student's attendance mobile application:

➤ User management

- Student registration: the system should allow students to create an account in the system that will let them enter their credentials according to the school and associate their fingerprint to their profile.
- Lecturer's registration: the system should allow lecturers to register through the system, they will be managed by the administrator.
- Course registration: students should register the different courses they are involved in, in order to be able to mark the attendance under each course they've registered.
- Lecturer's account: he will have the possibility to manage the attendance, open/close an attendance session, discard the attendance of a particular student or access the entire attendance.

➤ Attendance Marking and data

- Student Attendance Marking: The application should enable students to mark their attendance securely using fingerprint recognition.
- Student Attendance Viewing: Students should be able to view their attendance record in real-time.
- Instructors attendance access: lecturers should be able to access and export attendance data for their classes; students should access only their attendance, not for other students.

➤ Biometric Authentication:

- The system should support fingerprint biometric authentication methods.

- The biometric authentication process should be fast enough (less than 5 seconds per student), accurate and reliable.
- The system should provide feedback to students during the authentication process, indicating success or failure of account setting up.

➤ **Attendance Recording:**

- The system should record the timestamp and relevant attendance information when a student successfully authenticates. And at the end of the session, students who did not mark the attendance should automatically be absent in the course.
- The attendance records should be stored securely and be easily retrievable for reporting purposes.
- The system should handle multiple attendance sessions per day, such as lectures, tutorials, and labs.
- When a class is scheduled, the lecturer could take the attendance for that session.

➤ **Database managements**

- Database describes how student data will be stored securely and effectively
- The database should contain credentials of students in the school and their fingerprint associated to their profile
- Data about instructors should also be stored securely.

➤ **Real-time reporting**

- The lecturers should be able to access and download the attendance in multiple formats with relevant information such as date, time, name, matricule, course code, course title, etc.
- Students should receive real-time notifications in case a lecturer opens a session for attendance marking

3.2. Non-Functional Requirements

Non-functional requirements are criteria that describe qualities or attributes of a system, software application, or product, rather than its specific functionality. Here we will have to define the technical requirements of the app, including the platforms, technologies, and infrastructure that will be used including requirements for scalability, performance, and security.

The following non-functional requirements outline the desired qualities of the Biometric Student Attendance Mobile Application beyond its core functionalities:

➤ **Performance:**

- Response Time: The application should provide quick feedback to user actions (e.g., registration, attendance marking) within an acceptable period (e.g., less than 5 seconds).
- Offline Functionality: The application should allow offline attendance marking. Locally stored data should synchronize with the server when an internet connection becomes available.
- Battery Consumption: The application should be optimized for low battery usage to minimize impact on mobile device battery life.

➤ **Usability**

- User Interface (UI): The application should have a user-friendly and intuitive UI that is easy to navigate for users with varying levels of technical ability for students.
- Accessibility: accessibility guidelines should be implemented to ensure usability for individuals with disabilities (consider factors like text size adjustment, color contrast, and screen reader compatibility).
- Localization: The application interface and content should be adaptable to different languages to accommodate a diverse user base (optional).
- The biometric authentication process should be intuitive and require minimal training for users.
- The system should provide clear and informative error messages in case of authentication failures or system errors.

➤ **Reliability**

- Availability: The application should be highly available with minimal downtime to ensure students and faculty can reliably record attendance.
- Data Integrity: The application should ensure the accuracy and consistency of attendance data throughout the entire process (from marking attendance to data storage and retrieval).
- Error Handling: The application should gracefully handle errors and provide informative messages to guide the user in case of issues during registration, attendance marking, or data synchronization.

➤ **Security**

- Authentication: The application should implement strong authentication mechanisms for user registration, login to prevent unauthorized access and ensure the confidentiality and integrity of student biometric data.

- Data Security: Biometric data and student information should be encrypted both at rest (on the device) and in transit (during transmission) using industry-standard encryption algorithms.
- Authorization: The application should enforce access control mechanisms to ensure that only authorized users can perform specific actions (e.g., faculty initiating attendance sessions, viewing attendance data).

➤ **Maintainability**

- The application code should be well-documented, modular, and follow coding best practices to ease future maintenance and updates.
- The application should be designed to accommodate future integration with other institutional systems (e.g., student information system) if needed.

➤ **Portability**

- The application should be developed using a cross-platform framework or approach to ensure compatibility with different mobile operating systems (iOS, Android) with minimal code modification. The responsiveness should be implemented!!

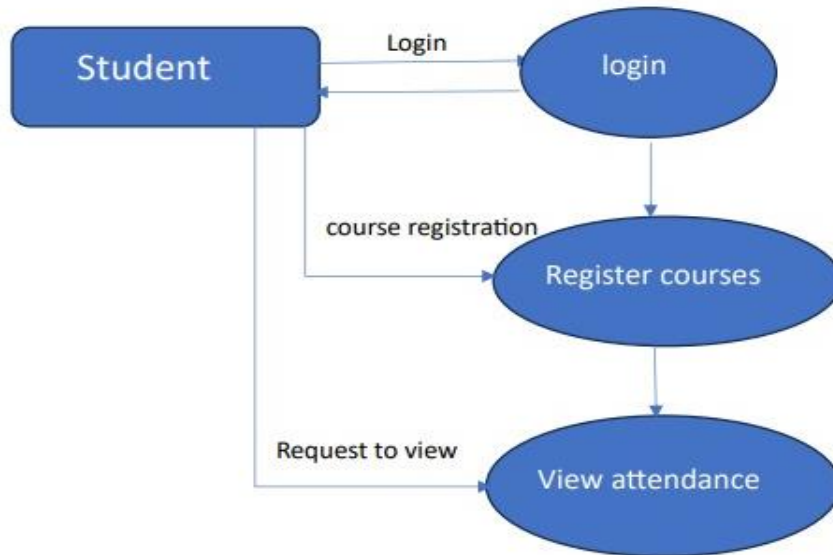
➤ **Scalability**

- The system should be able to handle a large number of students and attendance transactions without performance degradation.
- The response time for biometric authentication and attendance recording should be minimal to avoid delays (less than 5 seconds).

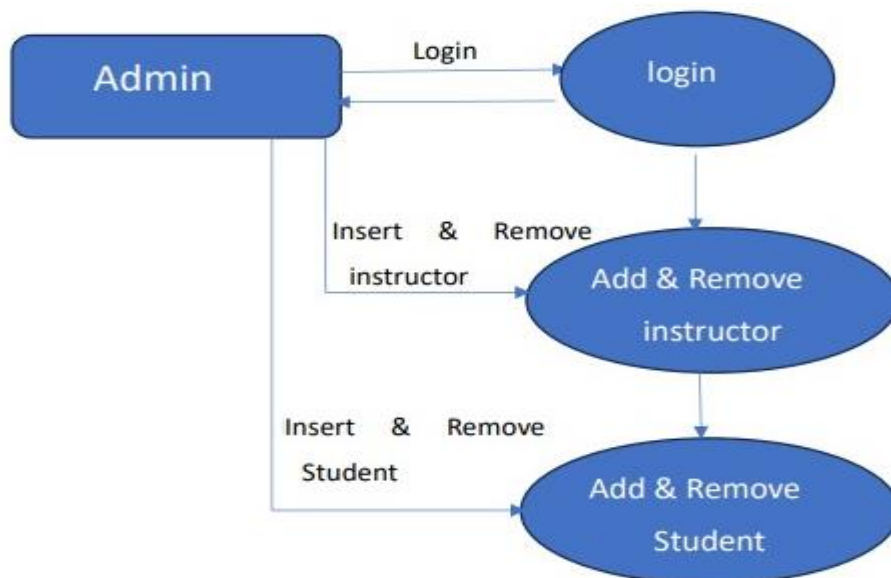
4. DATA-FLOW DIAGRAM OR MODEL

The Data Flow Diagram outlines the key processes involved in the system, including user management, attendance marking, and biometric authentication. It illustrates and helps to understand the flow of data and the interactions between different components of the system.

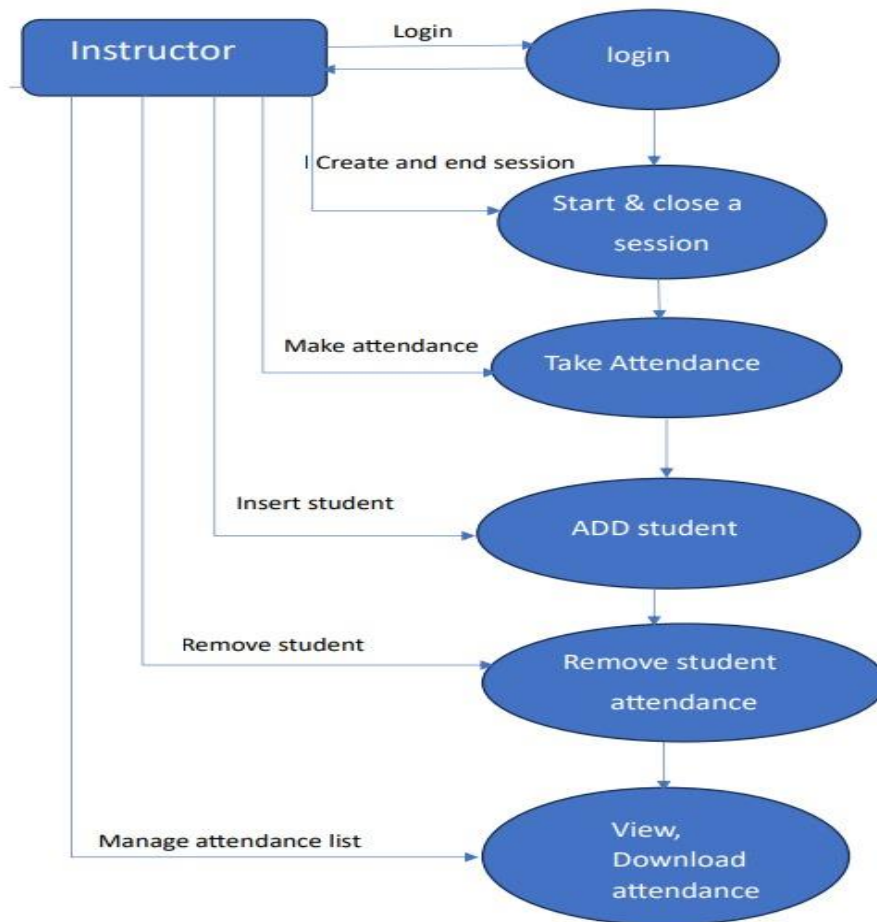
According to our end users, we have 03 diagrams:



Student Data Flow Diagram



Admin Data Flow Diagram



Instructor Data Flow Diagram

5. PRIORITIZATION OF REQUIREMENTS

Based on various factors like impact on users, business value, technical feasibility and user feedback and stakeholder input; we have prioritized our requirements to ensure that the development process focuses on delivering the most critical features and functionalities first, thereby maximizing the value of the biometric student attendance mobile application. This stage is crucial as it sets the foundation for the entire development process.

5.1. Functional requirements

- User management: student registration and authentication, instructor registration, student's profile management
- Attendance marking using fingerprint under each course
- Attendance data: student attendance view, admin attendance access
- Biometric authentication: support fingerprint recognition, accurate and reliable (less than 5 seconds per student), system validation/prompt

5.2. Non-functional requirements

- Performance and scalability
- Usability
- Scalability
- Reliability
- Security
- Maintainability
- Portability

5.3. User specific requirements

- User friendly interface.
- Ease navigation.
- Database integration.

6. CONSTRAINTS AND ASSUMPTIONS

Constraints and assumptions outline any limitations or conditions that may impact the development and implementation of the system. The key factors that must be considered during the development process are:

- **Compliance:** The biometric system should adhere to any legal and regulatory requirements about the collection and usage of biometric data.
- **Hardware Compatibility:** The system should be compatible with a range of biometric devices and sensors available on the market.
- **Integration:** The system should seamlessly integrate with existing university systems, such as student information systems or learning management systems, to streamline attendance management processes.

7. ACCEPTANCE CRITERIA

Acceptance criteria define the conditions that must be met for the system to be accepted by stakeholders. These criteria serve as benchmarks for evaluating the success of the project, ensuring that the final product meets the expectations and requirements of users and stakeholders

- **Accuracy:** the system should accurately identify and record student attendance with minimal false positives or false negatives
- **Speed:** the system should efficiently process biometric data to ensure timely recording of attendance without causing delays or disruption
- **Scalability:** it should be able to handle many students efficiently, especially in institutions with a high student population.
- **Security:** The system must ensure the security and privacy of biometric data, adhering to relevant regulations and standards to prevent unauthorized access or misuse.
- **Integration:** the system should seamlessly integrate with existing attendance management systems or databases to facilitate easy data management and reporting
- **User-friendly:** the system should be easy to use for both students and staff with clear instructions and intuitive interfaces

CONCLUSION

In conclusion, the development of a biometric student attendance mobile application that utilizes fingerprint recognition addresses the limitations of traditional attendance tracking methods. This requirement analysis document has highlighted the importance of embracing innovative solutions in educational institutions to overcome the challenges of manual roll calls. The requirement analysis for a biometric student attendance system underscores key aspect: security, scalability, user-friendliness, and compliance. So overall, the development of a biometric student attendance mobile application represents a significant step towards modernizing attendance tracking in educational institutions. By embracing innovative solutions, we can enhance accuracy, security, and efficiency in capturing student attendance, ultimately improving the overall educational experience for students and instructors alike.

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